Claims

Sub B'

1. A method of representing motion in a sequence of digitized images comprising deriving a dense motion vector field for an image and performing vector quantization on the motion vector field.

2. A method as claimed in claim 1 wherein a motion vector is derived for pixel blocks sized less than an 8x8 pixel block.

3. A method as claimed in claim 1 wherein a motion vector is derived for each pixel.

A 4. A method as claimed in ~~any one of claims 1 to 3~~ claim 1 wherein vector quantization is performed on the components of the motion vectors separately.

A 5. A method as claimed in ~~any one of claims 1 to 4~~ claim 1 comprising performing variable length coding after vector quantization.

A 6. A method as claimed in ~~any one of claims 1 to 5~~ claim 1 comprising identifying where motion discontinuities occur in the image.

A

7. A method as claimed in ~~any one of claims 1 to 6~~ claim 1 comprising processing the motion vector field to reduce the entropy of the vector field before vector quantization.

A

8. A method as claimed in claim 7 ~~dependent on claim 6~~ wherein the motion discontinuities are used in the entropy-reduction processing.

A

9. A method as claimed in claim 7 ~~or claim 8~~ wherein entropy-reduction is performed by averaging neighbouring motion vectors.

A

10. A method as claimed in claim 9 ~~dependent on claim 8~~ wherein a motion vector separated by a motion discontinuity is not used in the averaging.

A

11. A method as claimed in ~~any one of claims 1 to 10~~ claim 1 comprising generating and encoding a plurality of versions of a motion vector field at different resolutions.

12. A method as claimed in claim 11 comprising sub-sampling the motion vector field to produce sub-sampled versions of the field at a first, coarse, resolution and at a second, finer, resolution, coding the coarse resolution motion vector field, comparing the coarse resolution field with the

finer resolution field to produce a residual error, and coding the residual error at the finer resolution.

13. A method of processing data relating to an image in a sequence of digitized images comprising deriving a motion vector field for the image and smoothing the motion vector field by replacing a given motion vector by a new motion vector derived using averaging based on adjoining motion vectors, the method further comprising identifying where motion discontinuities occur in the image and omitting a motion vector or vectors from the averaging if they are separated from the given motion vector by a motion discontinuity.

14. A method as claimed in claim 13 wherein the new motion vector is derived using a prediction error.

15. A method of processing data relating to an image in a sequence of digitized images comprising deriving a motion vector field for the image and smoothing the motion vector field by replacing a given motion vector by a new motion vector derived using averaging based on adjoining motion vectors and on a prediction error.

16. A method as claimed in claim 15 comprising identifying where motion discontinuities occur in the image and omitting a motion vector or vectors from the averaging if they are separated from the given motion vectors by a motion discontinuity.

A 17. A method as claimed in ~~any one of claims 13 to 16~~ claim 13 wherein a motion vector is derived for each pixel.

A 18. A method as claimed in ~~any one of claims 13 to 17~~ claim 13 wherein the averaging takes account of the given motion vector.

19. A method as claimed in claim 18 using a weighted average.

20. A method of processing data relating to an image in a sequence of digitized images comprising deriving a motion vector field for the image, identifying where motion discontinuities occur in the image, and smoothing the motion vector field by combining adjacent motion vectors taking account of where motion discontinuities occur in the image.

21. A method as claimed in claim 20 wherein a motion vector is derived for each pixel.

22. A method of processing an image comprising deriving motion discontinuities representing motion boundaries in a motion vector field and adjusting motion vectors within each boundary on the basis of other motion vectors within that boundary.

23. A method of representing motion in a sequence of digitized images comprising generating and coding a plurality of versions of a motion vector field at different resolutions.

24. A method as claimed in claim 23 comprising sub-sampling the motion vector field to produce sub-sampled versions of the field at a first, coarse, resolution and at a second, finer, resolution, coding the coarse resolution version of the motion vector field, comparing the coarse resolution field with the finer resolution field to produce a residual error, and coding the residual error at the finer resolution.

25. A method as claimed in claim 24 comprising producing and coding a sequence of residual errors at increasing resolutions.

26. A method as claimed in ~~any one of claims 23 to 25~~ claim 23 comprising multiplexing the coded motion vector field versions at different resolutions into an embedded bit stream.

A 27. A method as claimed in ~~any one of claims 23 to 25~~ claim 23 wherein said coding is performed using vector quantization.

28. An encoder for encoding motion information for a sequence of A digitized images according to a method as claimed in ~~any one of claims 1 to~~ claim 1 A ~~27.~~

29. A decoder for decoding motion information for a sequence of A digitized images encoded according to a method as claimed in ~~any one of~~ claim 1 A ~~claims 1 to 27~~.

30. An encoder for encoding motion information for a sequence of digitized images comprising a motion estimator for deriving a dense motion vector field for an image and a vector quantizer for coding the motion vector field.

31. Apparatus for representing motion in a sequence of digitized images comprising means for generating and coding a plurality of versions of a motion vector field at different resolutions.

32. Apparatus as claimed in claim 31 comprising means for sub-sampling the motion vector field to produce sub-sampled versions of the field at a first, coarse, resolution and at a second, finer, resolution, means for comparing the coarse resolution field with the finer resolution field to produce a residual error, and means for coding the coarse resolution motion vector field and the residual error at the finer resolution.

33. Apparatus as claimed in claim 32 comprising means for producing and coding a sequence of residual errors at increasing resolutions.

34. A decoder for decoding information encoded using an apparatus as claimed in ~~any of claims 31 to 33~~ claim 31, the decoder comprising means for reinstating a version of the motion vector field at a desired resolution.

35. A hybrid DCT-MC codec comprising an encoder according to ~~any one of claims 28, 30 or 31 to 33~~ claim 28 and a decoder according to claim 29 ~~or claim 34~~.

36. An encoder substantially as hereinbefore described and as shown in the accompanying drawings.

37. A method for encoding motion information substantially as hereinbefore described with reference to the accompanying drawings.